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Canadian Transport Commission
Research Branch

Commission canadienne des transports
Direction de la recherche

Effects of Reduction in Grain Delivery Points on the Canadian Prairies

WP 30-85-10

Canada

EFFECTS OF REDUCTION IN GRAIN DELIVERY POINTS ON THE CANADIAN PRAIRIES

WP 30-85-10

Canadian Transport Commission
15 Eddy St., 15th floor, Ottawa-Hull K1A 0N9

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PREFACE

In the winter of 1984/85, the Freight Studies Directorate of the Research Branch prepared two studies on various aspects of the grain handling and transportation industry, to assist the Committee of Inquiry on Crow Benefit Payment. Publication of this work was delayed at the request of the Committee until the Committee had had adequate time to inform the Minister of Transport and Parliament of its recommendations. We are now releasing for public information and comment and to contribute to informed public discussion several reports which describe our studies. The following document is the fourth in the series and presents conclusions on the magnitude and distribution of savings possible to the grain production, transportation, and handling system in typical areas of each province if branchline and country elevator abandonments were to be implemented in future. The particular delivery points and branchlines mentioned in this report were chosen strictly for purposes of illustration and should not be misconstrued as being indicative of government intentions regarding network rationalization. Rather, they were used in preparing this research as a way to demonstrate the order of magnitude impacts on producers, country elevators, and the railways of delivery point closure and rail branch line rationalization.

The interested reader is encouraged to obtain also the initial publication in this series, titled P.H.A.E.R.: AN OVERVIEW, WP-30-85-08 which presents a review of the Producer Haul and Elevator Receipts information system and summarizes the diverse research for which PHAER was used in past years. PHAER gives unique attention to integrating farm production, trucking cost, elevation service and rail service components into an analytical model that is based on data on actual deliveries made by farmers to country elevators.

Any conclusions and opinions should not be interpreted as the position of the Canadian Transport Commission or any of its Committees. Research Branch publications cited herein may be requested from the Publications Division, CTC, Ottawa K1A-0N9. Questions or comments regarding this report should be addressed directly to A.W. Gemmell or R.L. Baldwin, Agricultural Products Division, at 819-997-6541.

R. Lake
Executive Director
Research Branch

Canada

EFFECTS OF REDUCTION IN GRAIN DELIVERY POINTS ON THE CANADIAN PRAIRIES

A REPORT TO
THE COMMITTEE OF INQUIRY
ON THE CROW BENEFIT PAYMENT

Prepared by:

A.W. Gemmell and staff

Freight Studies Directorate

Research Branch

Canadian Transport Commission

Ottawa

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Table of Contents

Section	Page
Purpose	1
Introduction	1
Methodology	2
Results	4
Summary and Conclusions	7
List of Tables	
A. Detail of Input by Study Area	
1. Scenario: Saskatchewan - Mantario, White Bear	9
2. Scenario: Saskatchewan - Macklin, Kerrobert	10
3. Scenario: Manitoba - Lyleton, Napinka, LaRiviére	11
4. Scenario: Alberta - Lomond, Aldersyde, MacLeod, Turin	12
B. Differences in Total and Average Costs by Study Area	
5. Scenario: Saskatchewan - Mantario, White Bear	13
6. Scenario: Saskatchewan - Macklin, Kerrobert	14
7. Scenario: Manitoba	15
8. Scenario: Alberta	16
C. Tables Summarizing Cost/Traffic Impact by Mode	
9. Assumed Rail Traffic Redistribution	17
10. Estimated Fixed Costs of Elevator Operation	18
11. Trucking Costs Using Alternative Trucking Systems	19
12. Summary of Maximum Savings and Efficiencies	20
Appendix 1: List of Delivery Points	21
Figures 1 to 4: Maps of Rail Subdivisions in the Study Areas	24 - 27

Purpose:

The purpose of this document is to provide an indication to the Committee of Inquiry of the nature of the cost changes and economies that may be available to the grain handling and transportation system if there were to be a change in the network of delivery points available to grain producers.

Introduction:

As has been described in earlier documents, a selection was made of branch lines and delivery points in grain producing areas of the Prairies. These areas are considered to be roughly representative of their respective provinces and of the Prairies as a whole.

In Alberta, the Lomond, Aldersyde, MacLeod, and Turin Subdivisions were selected. In Saskatchewan, two areas were chosen: the Macklin and Kerrobert Subdivisions, and the Mantario and White Bear Subdivisions. The Lyleton, Napinka, and La Riviere Subdivisions represent Manitoba.

It is possible to argue that other areas could have been chosen that might represent the provinces and the Prairies in other ways, and that such alternative representation might give somewhat different results in a detailed analysis, but it is felt nonetheless true that considerable insight can be gained from looking at these selected areas, in terms of the efforts that the various institutions, persons, and companies make to move the grain from farm to market.

The basic descriptions of these sample areas are available in the report "The Distribution of the Grain Handling and Transportation Costs of Prairie Farmers from 1977/78 to 1995/96", which was forwarded on February 12, 1985 to the Committee of Inquiry on the Crow Benefit Payment[1]. Section 3 of that report is most pertinent and its maps 1 - 4, which indicate where these sample areas are to be found, have been included here for reference.

Methodology:

Having selected the railway subdivisions in each province, and thereby having selected a grain producing area and the grain delivery points in each, it was necessary to select a subset of these delivery points to provide an indication of a more efficient grain delivery system, such as might evolve in the future.

It would have been possible to select points without reference to other work, but, as it happenend, a major study on the role of trucking in the grain industry was being sponsored by Transport Canada at the same time,[2] and both the Inquiry Committee and the consultant on the latter study felt it would be useful to have consistency in approach between the two studies, and at the same time reduce the processing costs involved. The consultant for the Transport Canada study had already made a selection of delivery points likely to remain in use across the Prairies, including the sample areas

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[1] Baldwin, R.L., Freight Studies Directorate, Canadian Transport Commission, February, 1985.

[2] The Role of Trucking in the Grain Industry: IBI Group, February 1985

selected for the Inquiry Committee. Thus, these points are the ones used in this analysis. Appendix 1 provides information on which delivery points have been eliminated in each of the scenarios for the purposes of this study, i.e. to estimate the system efficiencies that may be possible with a reduced delivery point and rail network. It should not be construed that these sets of hypothetical abandonments are indicative of government policy with respect to the network, or the desirability of closing, or retaining, any given rail line or delivery point. They show only one possibility for sample analysis purposes.

Costs pertinent to this analysis are: the costs that the farmers will have to bear to move their grain from farm to primary elevator; the cost of elevation and handling at the primary elevator; and the cost of railway transportation from the primary delivery point to port of destination for export.

To accomplish this analysis, the PHAER system, mentioned in the earlier document, has been used to provide a first estimate of these costs. As has been described in considerable detail in the document "PHAER: An Overview", quite reliable estimates can be made of the costs of transporting grain by farm truck, and elevating the grain at primary delivery points. The costs of rail transportation are not as reliably estimated at this time.

To supplement the above rail costs, the railway companies were asked by the Inquiry Committee to assist the Commission in undertaking this work, and the railways agreed to do so.

Results:

Tables 1 - 4 provide a summary of the results of grain delivery point consolidation from the existing prairie-wide network of some 1250 delivery points to 800, 650, and 300 delivery points. (No estimate is made of the commensurate change in the number of primary elevators.) These results are based on the grain volumes delivered in the crop year 1981-82, and the delivery points that existed in 1984-85.

The first lines in these tables indicate the number of producers that were deli'ering to study area delivery points shown in the corresponding column of Appendix I prior to those delivery points, being considered closed for the purpose of this analysis; they also show the total number of bushels being delivered by those producers. With this hypothetical closure, the grain producers were forced to select another delivery point to deliver their grain, and this was done by the PHAER model in accordance with the rule that the grain producer is an "economic man", and will seek to minimize the distances (and the costs, by assumption) he would have to haul this grain.

The following two sections (numbered as 3 and 4) in these tables show the PHAER estimate of the systems' costs resulting from the proposed changes, as "before" and "after" the delivery point consolidation. In each case it is the cost of the service or movement, and not the tariff charged for providing the service. This latter concept has been more thoroughly explored in the earlier document. The costs are shown in two ways: as a total for the sample area; and as a cost per 1000 bushels in the sample area. The efforts involved in the movements are shown in section 5 of these tables

as the elevator throughput, the producer truck haul, and the railway haul. There are other indicators that may be useful, especially for the railway effort, but PHAER does not provide an estimate of them and the bushel miles are used as the best proxy available from PHAER.

Tables 5 - 8 show the cost changes that occur for truck, elevator and rail operations as delivery point and rail consolidation is assumed to take place. Negative numbers in these four tables indicate a reduction in costs.

It is noteworthy that savings do not exist, or are nominal for the smallest consolidation effort, to some 800 delivery points, and that the rail costs and truck costs typically rise slightly in these scenarios, while the elevation costs are reduced somewhat. This result occurs because the redistribution of the grain to alternative delivery points involves longer truck hauls in almost all cases, and the rail haul is also lengthened very slightly on balance, especially on higher cost branch lines, as opposed to lower cost main lines. Table 9 provides an indication of the magnitude of change in two of the scenarios, with respect to the way in which grain is redistributed to branch lines and main lines by the model's behaviour, as the delivery point rationalization proceeds[3]. (It is to be recalled that our estimate of the cost of operating on a branch line is about $.11 per tonne mile, as opposed to about $.025 per tonne mile on a main line.) In each scenario in the 800 series, the elevator throughputs are the same or somewhat

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[3] See Table 10: rail volume redistribution is not discussed further here, but was covered in detail in a subsequent analysis done in conjunction with the railways.

improved, while the length of producer haul is longer by about 30%. Rail haul remains unchanged.

In the 650 and 300 series, there are almost always overall cost savings (the exception being the Manitoba 650 scenario, to which the above comments also apply.) Typically, in these cases, the costs of elevation and rail haul fall, while the costs of truck rise quite substantially, in line with the distances being covered.

In each of the cases covered in these tables, the cost savings that can be attributed to a reduction in the network of elevators has not been taken into account. As the tables 1-4 make clear, there is invariably a saving in operating costs, in some cases, quite small ($40 - $50 thousand) and growing as consolidation increases (to as much as about $1.5 million) Fixed cost savings. of between $135 thousand in the least consolidation case and $3.4 million in the maximum consolidation situation could be added to these operating cost savings. These savings would arise because the elevators presently on the lines assumed to be abandoned would no longer have to be operated, and the fixed and operating costs associated with them could be saved. The following table (Table 10) sets out the annual fixed costs that would be saved in each scenario. The savings in terms of costs per 1000 bushels is also set out, and ranges from about $106 to $180.

The changes in costs of trucking grain in each scenario are assumed to have arisen based on the use of the same vehicles by the farmer -typically a farm truck of about an eight tonne size and about 10 years old. In fact, it is quite likely that farmers faced with longer hauls would turn to larger,

more efficient vehicles, perhaps using (or performing) more custom haulage, or hiring commercial trucking companies to move their grain to market. The costs of moving grain in these latter ways are lower, and Table 10 provides an indication of the resulting costs (on a per tonne mile basis) of using a 40 tonne "B" train to move the grain, as compared to the smaller farm truck.

Calculations using the algorithms available in the PHAER system conservatively suggest that by using a 25 tonne rig costs could be reduced by about 33 percent, and by using a 40 tonne "B" train, by up to about 50 percent.[4] This results in the costs for trucking found in Table 11, using the Alberta 300 Scenario as an example in which quite significant increases in trucking costs are hypothesized to occur.

Summary and Conclusions:

It is clear that if elevator consolidation occurs trucking cost will increase, that elevator costs will decrease, and that rail costs could decrease. It would seem likely that using larger, more efficient trucks could reduce the cost impacts of having to haul longer distances. Table 12 provides a "before" and "after abandonment" picture for the scenarios in Tables 1 - 4, given the estimates of present costs, and the estimates of the minimum cost.

The sources of the cost reductions between the "before" and the minimum cost estimates are:

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[4] Based on five year old vehicles with an annual usage of 25,000 miles

for farm trucking, the use of newer, larger farm vehicles with a more efficient operation, and the possibilities of contracting custom and commercial truckers, incorporating their annual mileage to absorb fixed costs

for elevators, the more intensive use of present facilities and the elimination of a number of elevators, with the associated fixed costs

for railways, the shifting of grain from branch lines to main lines, accumulating grain in larger lots, and reducing the number of trains to be run to collect the trains for forwarding to port.

A comment, that may be in order on these efficiencies and savings, is that in the end it is likely they are largely to accrue to the grain producers. The costs of trucking are normally borne directly by the producer, and much of the elevating capacity is owned by producer cooperatives. Under the existing legislation, changes in railway costs are to be factored every four years into the rate base for calculating the statutory grain rates, and those cost changes will include efficiency gains made through the redistribution of grain to alternative rail points, such as is suggested in this analysis.

TABLE 1

Detail of Impact by Study Area

SCENARIO: Saskatchewan - Mantario, White Bear

			Number of Delivery Points Remaining: 800	650	300
1. Number of Producers Affected			128	308	1142
2. Bushels Affected (000)			746	1746	7246
Operating Costs;					
3. Total Costs: ($000)	a) truck:	before	27	70	282
		after	40	118	528
	b) elevator:	before	197	431	1679
		after	147	344	1143
	c) railway:	before	678	2439	9265
		after	734	903	6181
	d) total:	before	902	2940	11226
		after	921	1365	7852
4. Cost/1000 Bu:	a) truck:	before	36	40	38
		after	53	67	72
	b) elevator:	before	263	246	231
		after	196	196	157
	c) railway:	before	907	1396	1278
		after	983	517	852
	d) total:	before	1206	1682	1547
		after	1232	780	1081
5. Impacts: a) Elevator Thruput: (receipts/capacity)		before	3.76	3.01	3.28
		after	3.78	3.48	4.59
b) Producer truck haul: (miles)		before	5.4	6.2	7.7
		after	8.9	12.1	13.4
c) Rail haul: (billions of bu.mi)		before	0.79	1.89	7.78
		after	0.79	1.68	7.40

Source: Freight Studies Directorate, Research Branch
Canadian Transport Commission
PHAER Model.

TABLE 2

Detail of Impact by Study Area

SCENARIO: Saskatchewan - Macklin, Kerrobert

			Number of Delivery Points Remaining: 800	650	300
1. Number of Producers Affected			238	1260	1343
2. Bushels Affected (000)			1385	9324	9974
Operating Costs;					
3. Total Costs: ($000)	a) truck:	before	49	349	372
		after	65	632	1003
	b) elevator:	before	322	1958	2114
		after	243	1518	1498
	c) railway:	before	1150	7073	7408
		after	1109	4589	5499
	d) total:	before	1521	9380	9894
		after	1417	6739	8000
4. Cost/1000 Bu:	a) truck:	before	35	37	37
		after	46	67	100
	b) elevator:	before	232	209	211
		after	175	162	150
	c) railway:	before	830	758	742
		after	801	492	551
	d) total:	before	1097	1004	990
		after	1022	721	801
5. Impacts: a) Elevator Thruput: (receipts/capacity)		before	3.90	3.16	3.37
		after	4.35	4.77	4.84
b) Producer truck haul: (miles)		before	6.3	7.7	7.5
		after	7.4	12.2	19.9
c) Rail haul: (billions of bu.mi)		before	1.37	9.15	9.79
		after	1.37	8.81	9.57

Source: Freight Studies Directorate, Research Branch
Canadian Transport Commission
PHAER Model.

TABLE 3

Detail of Impact by Study Area

SCENARIO: Manitoba - Lyleton, Napinka, LaRiviere

			Number of Delivery Points Remaining: 800	650	300
1. Number of Producers Affected			302	419	1395
2. Bushels Affected (000)			1706	2417	8263
Operating Costs;					
3. Total Costs: ($000)	a) truck:	before	58	84	311
		after	96	136	618
	b) elevator:	before	341	486	1542
		after	281	359	1190
	c) railway:	before	816	1052	4412
		after	859	1133	3843
	d) total:	before	1215	1622	6265
		after	1236	1628	5621
4. Cost/1000 Bu:	a) truck:	before	34	34	37
		after	56	56	74
	b) elevator:	before	199	200	186
		after	164	148	144
	c) railway:	before	478	435	533
		after	503	468	465
	d) total:	before	711	669	756
		after	723	672	683
5. Impacts: a) Elevator Thruput: (receipts/capacity)		before	3.86	4.26	4.27
		after	4.35	5.83	5.49
b) Producer truck haul: (miles)		before	6.2	6.1	7.2
		after	9.6	9.5	13.8
c) Rail haul: (billions of bu.mi)		before	0.99	1.45	4.62
		after	0.99	1.45	4.62

Source: Freight Studies Directorate, Research Branch
Canadian Transport Commission
PHAER Model.

TABLE 4

Detail of Impact by Study Area

SCENARIO: Alberta - Lomond, Aldersyde, MacLeod, Turin

			Number of Delivery Points Remaining: 800	650	300
1. Number of Producers Affected			405	2058	2583
2. Bushels Affected (000)			3703	19443	25013
Operating Costs;					
3. Total Costs: ($000)	a) truck:	before	122	652	815
		after	211	1948	2563
	b) elevator:	before	941	4108	5323
		after	658	3117	3627
	c) railway:	before	1565	9459	11603
		after	1803	7832	10069
	d) total:	before	2628	14219	17741
		after	2672	12897	16259
4. Cost/1000 Bu:	a) truck:	before	32	33	32
		after	57	100	102
	b) elevator:	before	254	211	212
		after	177	160	144
	c) railway:	before	422	486	463
		after	486	402	402
	d) total:	before	708	730	707
		after	720	662	648
5. Impacts: a) Elevator Thruput: (receipts/capacity)		before	2.98	2.88	3.14
		after	3.52	4.53	5.21
b) Producer truck haul: (miles)		before	7.7	8.3	8.3
		after	9.9	20.0	20.6
c) Rail haul: (billions of bu.mi)		before	2.83	14.45	18.45
		after	2.83	15.00	19.15

Source: Freight Studies Directorate, Research Branch
Canadian Transport Commission
PHAER Model.

TABLE 5

Differences in Total and Average Costs

SCENARIO: Saskatchewan - Mantario, White Bear

	Number of Delivery Points Remaining: 800	650	300
Total Cost Changes: ($000)			
Truck cost changes	13	48	246
Elevator cost changes	-50	-87	-536
Rail cost changes	56	-1536	-3084
Total cost changes	19	-1575	-3374
Cost Changes/1000 Bushels: ($)			
Truck cost changes	17	27	34
Elevator cost changes	-67	-50	-74
Rail cost changes	76	-879	-426
Total cost changes	26	-902	-466

TABLE 6

Differences in Total and Average Costs

SCENARIO: Saskatchewan - Macklin, Kerrobert

	Number of Delivery Points Remaining: 800	650	300
Total Cost Changes: ($000)			
Truck cost changes	16	283	631
Elevator cost changes	-79	-440	-616
Rail cost changes	-41	-2484	-1909
Total cost changes	-104	-2641	-1894
Cost Changes/1000 Bushels: ($)			
Truck cost changes	11	30	63
Elevator cost changes	-57	-47	-61
Rail cost changes	-29	-266	-191
Total cost changes	26	-283	-189

TABLE 7

Differences in Total and Average Costs

SCENARIO: Manitoba - Lyleton, Napinka, LaRiviere

	Number of Delivery Points Remaining: 800	650	300
Total Cost Changes: ($000)			
Truck cost changes	38	52	307
Elevator cost changes	-60	-127	-352
Rail cost changes	43	81	-569
Total cost changes	21	6	-614
Cost Changes/1000 Bushels: ($)			
Truck cost changes	22	22	37
Elevator cost changes	-35	-52	-42
Rail cost changes	25	33	-68
Total cost changes	12	3	-73

TABLE 8

Differences in Total and Average Costs

SCENARIO: Alberta - Lomond, Aldersyde, MacLeod, Turin.

	Number of Delivery Points Remaining: 800	650	300
Total Cost Changes: ($000)			
Truck cost changes	89	1296	1748
Elevator cost changes	-238	-991	-1696
Rail cost changes	238	-1627	-1534
Total cost changes	44	-1322	-1482
Cost Changes/1000 Bushels: ($)			
Truck cost changes	25	67	70
Elevator cost changes	-77	-51	-68
Rail cost changes	64	-84	-61
Total cost changes	12	-68	-59

Table 9

ASSUMED RAIL TRAFFIC REDISTRIBUTION
AFTER DELIVERY POINT CONSOLIDATION

	Scenarios			
	Alberta		Saskatchewan (Macklin-Kerrobert)	
	Number of Delivery Points Remaining			
Type of Traffic Distribution (000 bushels)	800	300	800	300
Main Line to Main Line	321	4803	-	-
Branch Line to Branch Line	3275	8954	1276	7792
Main Line to Branch Line	1	36	-	-
Branch Line to Main Line	106	11220	109	2182
Total Traffic	3703	25013	1385	9974
Traffic Before Redistribution:				
Originating on Branch Lines	3381	20174	1276	7792
Originating on Main Lines	322	4839	109	2182
Total Traffic	3703	25013	1385	9974
Percentage of Traffic Redistributed				
Main Line to Main Line	8.7	19.2	-	-
Branch Line to Branch Line	88.4	35.8	92.1	78.1
Main Line to Branch Line	0.0	0.1	-	-
Branch Line to Main Line	2.9	44.9	7.9	21.9
Total	100.0	100.0	100.0	100.0

TABLE 10:

ESTIMATED FIXED COSTS OF ELEVATOR OPERATION
AT POINTS ASSUMED TO BE ABANDONED

Scenario	Number of Delivery Points Remaining: 800	650	300
Number of Delivery Points Abandoned:			
1. Saskatchewan, Mantario, White Bear	2	3	9
2. Saskatchewan Macklin, Kerrobert	3	10	11
3. Manitoba	4	5	11
4. Alberta	7	19	25
Annual Total Fixed Costs of Delivery Points: ($000)			
1. Saskatchewan, Mantario, White Bear	135	274	1063
2. Saskatchewan, Macklin, Kerrobert	198	1161	1258
3. Manitoba	201	293	880
4. Alberta	671	2572	3440
Annual Fixed Costs of Delivery Points per 1000 Bushels:			
1. Saskatchewan, Mantario, White Bear	180	157	146
2. Saskatchewan, Macklin, Kerrobert	142	124	126
3. Manitoba	117	121	106
4. Alberta	181	132	137

Source: Freight Studies Directorate, Research Branch
Canadian Transport Commission
PHAER Model.

Table 11

TRUCKING COSTS USING ALTERNATIVE TRUCKING SYSTEMS

	ALBERTA 300 SCENARIO			
	Total Costs		$/1000 Bushels	
	Before	After	Before	After
farm truck	815	2653	32	102
25 tonne truck	-	1700*	-	70*
40 tonne truck	-	1300*	-	50*

* approximations based on PHAER algorithms.

Table 12

SUMMARY OF MAXIMUM SAVINGS AND EFFICIENCIES
BY SCENARIO

Operating Costs:			Number of Delivery Points Remaining 800	650	300
1. Total Costs: ($000)	Saskatchewan Mantario, W.B.	before	902	2940	11226
		min. after*	901	1306	7588
	Saskatchewan Macklin, Kerrt	before	1521	9380	9894
		min. after	1385	6423	7499
	Manitoba	before	1215	1622	6265
		min. after	1188	1560	5342
	Alberta	before	2628	14219	17741
		min. after	2566	11924	14976
2. Costs/1000bu: ($)	Saskatchewan Mantario, W.B.	before	1206	1682	1547
		min. after	1206	747	1045
	Saskatchewan Macklin, Kerrt	before	1097	1004	990
		min. after	999	688	751
	Manitoba	before	711	669	756
		min. after	695	644	646
	Alberta	before	708	730	707
		min. after	692	612	596

* minimum after differs from results in Tables 1 - 4 due to lower truck costs.

Source: Freight Studies Directorate, Research Branch
Canadian Transport Commission
PHAER Model.

Appendix I

Lists of Delivery Points

Appendix I

Number of Delivery Points Abandoned Across Network

In Study Area	800	650	300
Saskatchewan Mantario, White Bear	Alsask Tyner	Isham Lacadena Tyner	Alsask Eston Glidden Isham Lacadena Laporte Mantario Snipe Lake Tyner
Saskatchewan Macklin, Kerrobert	Druid Primate Stranraer	Denzil Dodsland Druid Hershel Luseland Milden Plenty Primate Sovereign Stranraer	Denzil Dodsland Druid Herschel Luseland Milden Plenty Primate Salvador Sovereign Stranraer
Manitoba	Clearwater Goodlands Mather Napinka	Clearwater Goodlands Mather Napinka Waskada	Cartwright Clearwater Goodlands La Rivière Mather Medora Napinka Ninga Pilot Mound Plum Coulee Waskada

In Study Area	800	650	300
Alberta	Ensign	Cayley	Brant
Lomond	Herronton	Claresholm	Carmangay
Aldersyde	Iron Springs	Enchant	Cayley
Turin	Parkland	Ensign	Claresholm
MacLeod	Shouldice	Granum	Enchant
	Travers	Hays	Ensign
	Turin	Herronton	Granum
		High River	Hays
		Iron Springs	Herronton
		Lomond	High River
		Nanton	Iron Springs
		Parkland	Lomond
		Picture Butte	Mazeppa
		Retlaw	Nanton
		Shouldice	Nobleford
		Stavely	Okotoks
		Travers	Parkland
		Turin	Picture Butte
		Vauxhall	Queenstown
			Retlaw
			Shouldice
			Stavely
			Turin
			Vauxhall

FIGURE 1

MANTARIO, WHITE BEAR & ELROSE CN

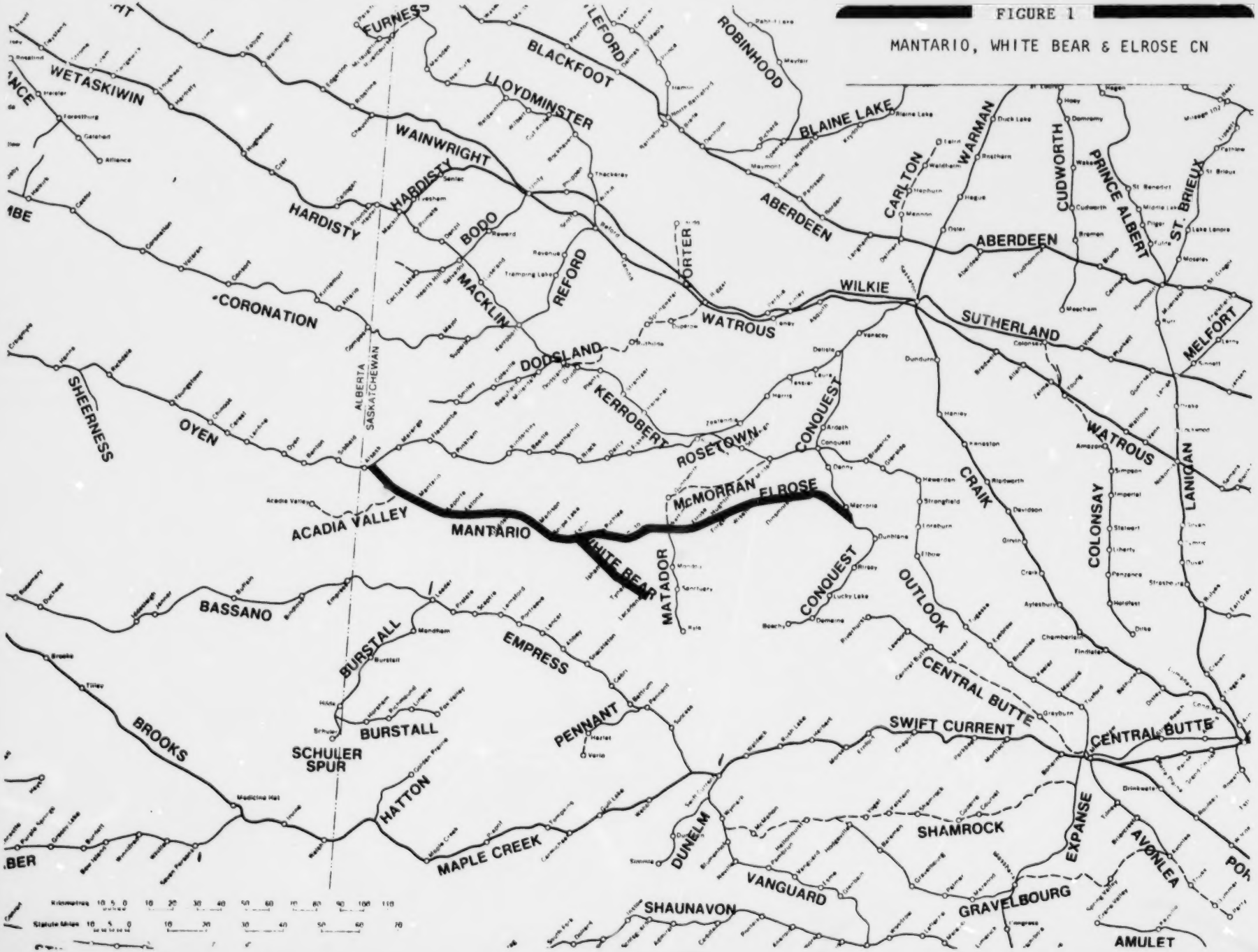


FIGURE 2

MACKLIN & KERROBERT CP

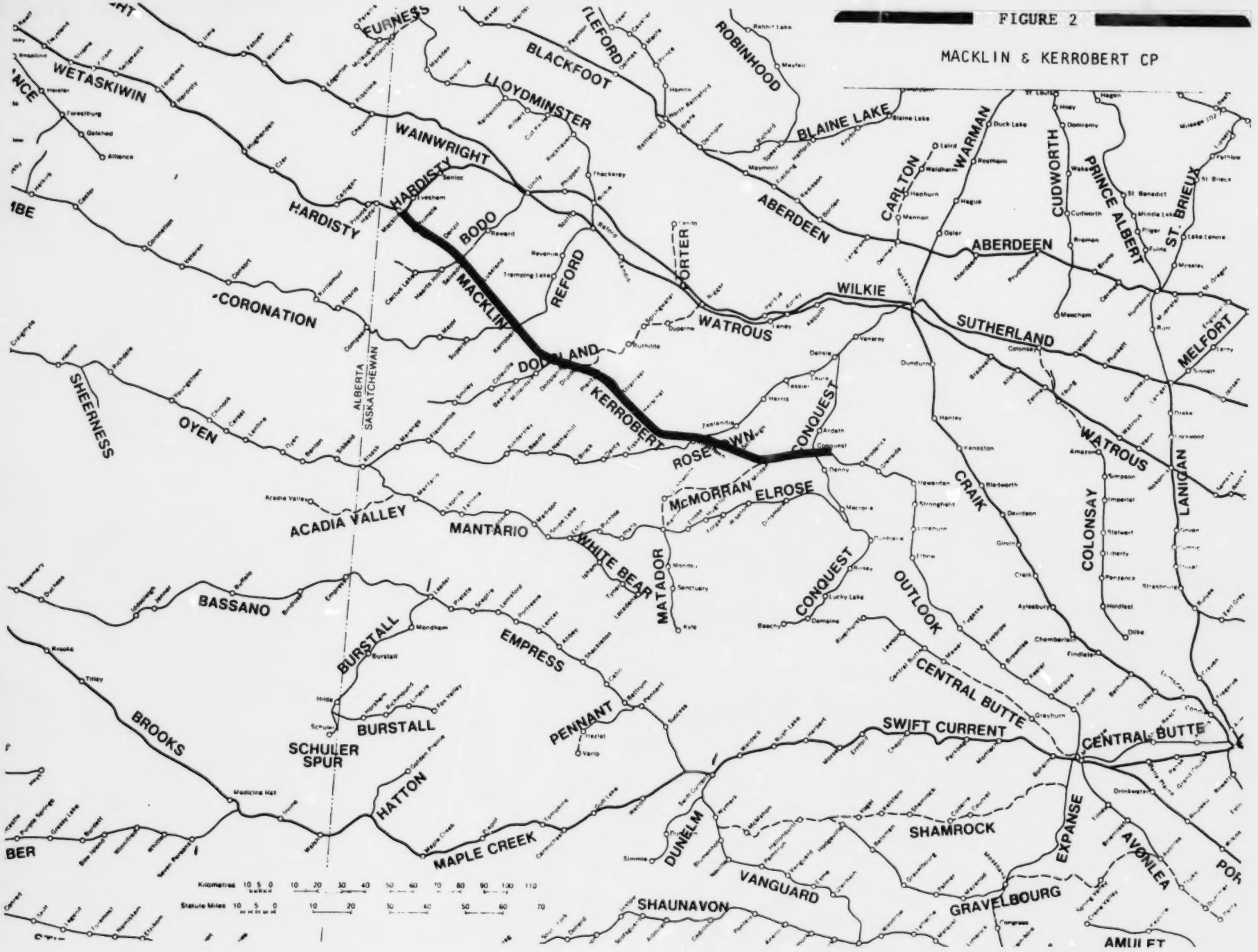


FIGURE 3

NAPINKA & LA RIVIERE CP

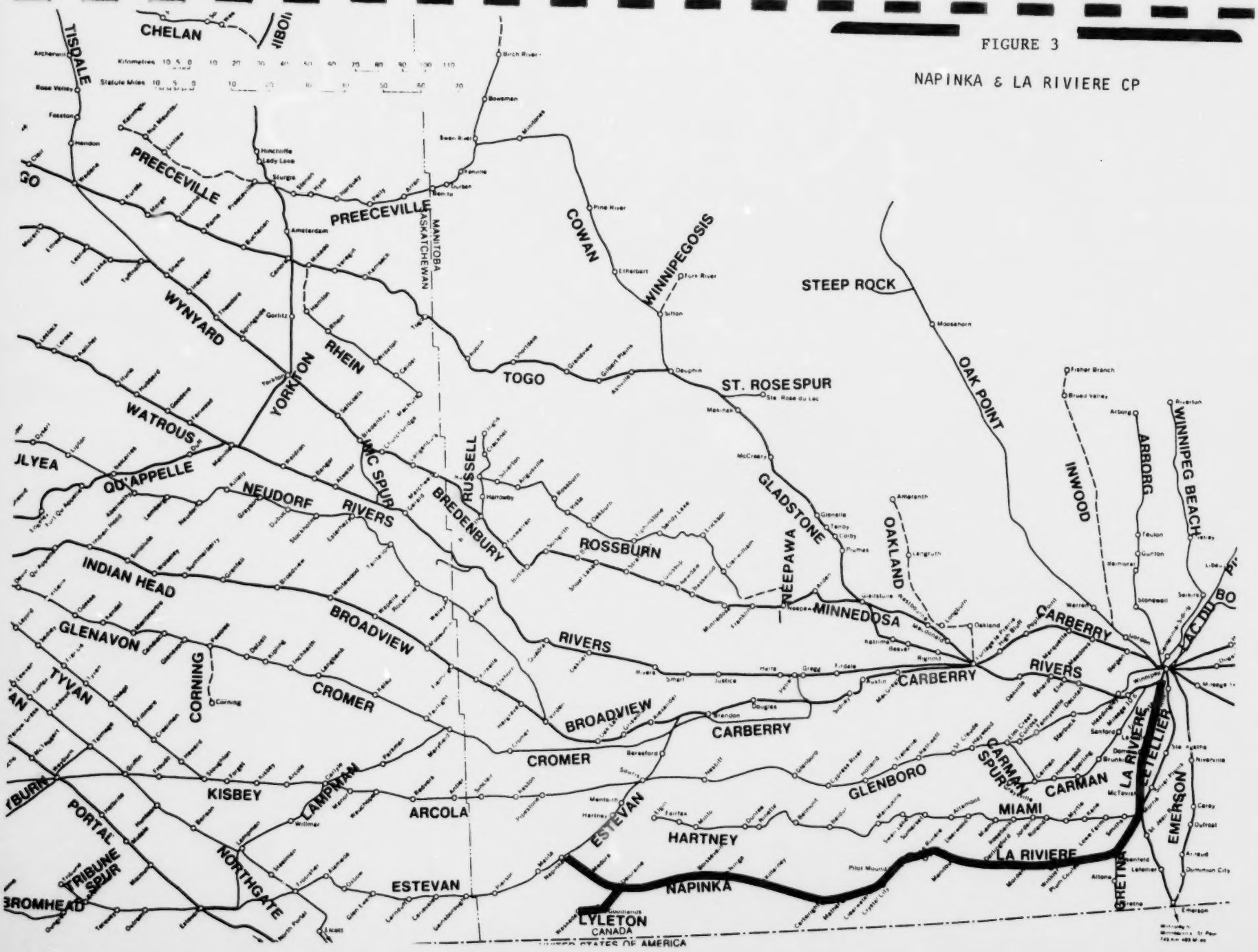
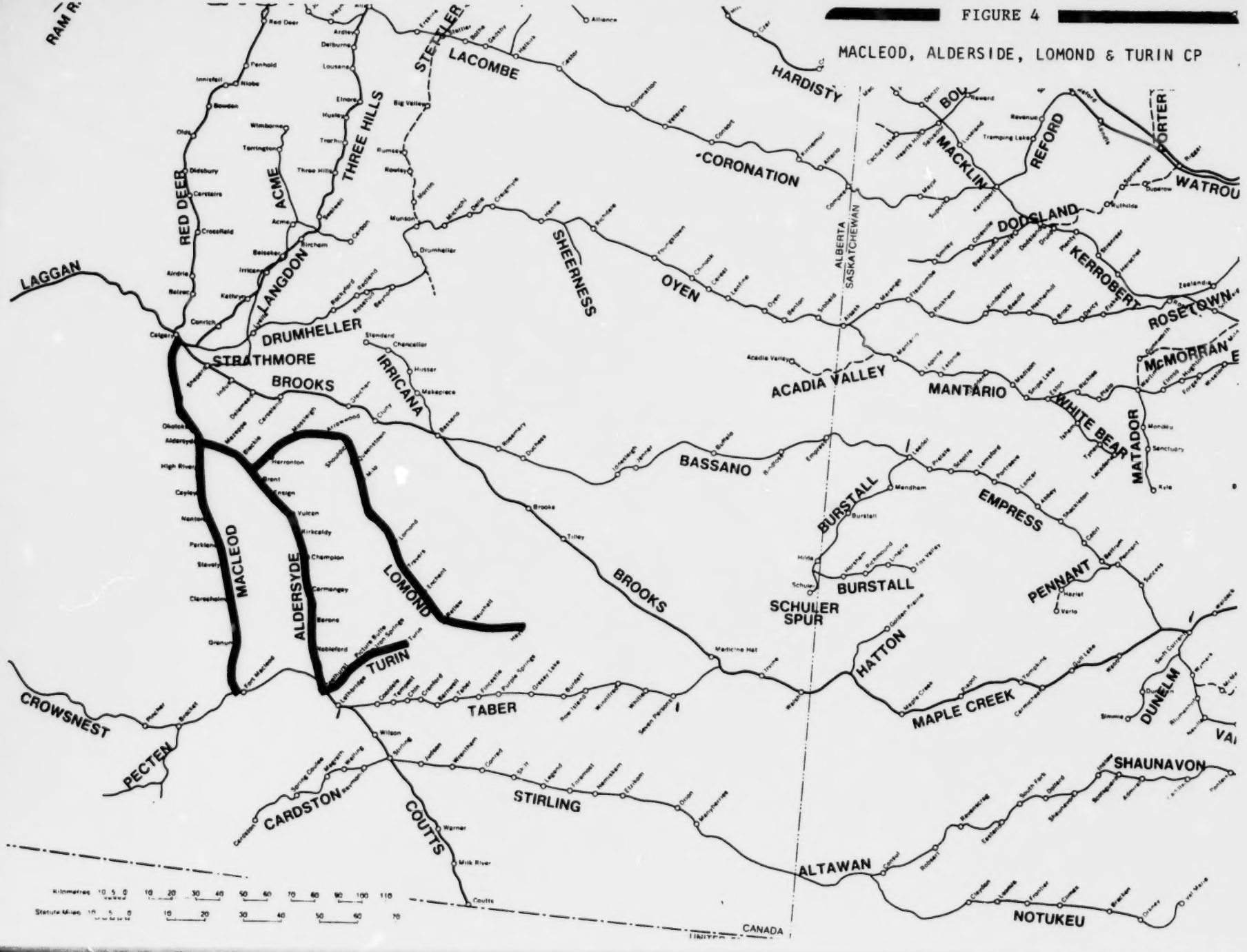


FIGURE 4

MACLEOD, ALDERSIDE, LOMOND & TURIN CP



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